

1 1. A vaporizer for vaporizing a liquid and mixing the
 2 vaporized liquid with a carrier gas, comprising:
 3 a valve body defining a control valve cavity having
 4 first, second and third apertures,
 5 a gas inlet port connected to said first aperture
 6 through a first fluid channel for receiving said carrier gas
 7 at a given pressure,
 8 a liquid inlet port connected to said second aperture
 9 through a second fluid channel for receiving said liquid at
 10 a flow rate and a pressure above said given pressure,
 11 a closure element disposed adjacent to said second
 12 aperture for forming a vaporization region having a pressure
 13 gradient, said vaporization region circumscribing said liquid
 14 inlet port and having a substantially larger width than said
 15 inlet port, and
 16 an outlet port connected to said third aperture
 17 through a third fluid channel,
 18 wherein liquid supplied through said liquid inlet port
 19 vaporizes in said valve cavity to form a vaporized liquid,
 20 mixes with said carrier gas, and is carried out of said
 21 vaporizer through said outlet port.

1 2. The vaporizer of claim 1, wherein
 2 said closure element is a diaphragm movable relative
 3 to said second aperture to increase or decrease said flow rate
 4 and further comprising
 5 an actuator for moving said diaphragm toward and away
 6 from said second aperture in response to a control signal.

1 3. The vaporizer of claim 2, further comprising
2 a liquid flow meter connected to measure the flow rate
3 of liquid into said liquid inlet port,
4 a feedback control system for providing said control
5 signal in response to a flow rate measured by said liquid flow
6 meter so as to regulate the flow rate of the liquid to
7 approximate a selected value.

1 4. The vaporizer of claim 2, wherein said actuator is
2 a piezoelectric member responsive to said control signal.

1 5. The vaporizer of claim 1 further comprising a
2 heater for heating at least a portion of said valve body near
3 to said cavity so as to inhibit said liquid from condensing
4 after it has vaporized.

1 6. The vaporizer of claim 2 further comprising a
2 heater for heating at least a portion of said valve body near
3 to said cavity so as to inhibit said liquid from condensing
4 after it has vaporized.

1 7. The vaporizer of claim 3 further comprising a
2 heater for heating at least a portion of said valve body near
3 to said cavity so as to inhibit said liquid from condensing
4 after it has vaporized.

1 8. A chemical vapor deposition system using a liquid
2 reactant and a carrier gas, comprising:

3 a chemical vapor deposition chamber having a gas inlet
4 port, and

5 a liquid reactant vaporizer having an outlet p rt
6 connected to said chamber inlet port, said vaporizer
7 comprising:

8 a valve body defining a control valve cavity
9 having first, second and third apertures, said outlet
10 port connected to said third aperture through a first
11 fluid channel,

12 a gas inlet port connected to said first aperture
13 through a second fluid channel for receiving said
14 carrier gas at a given pressure,

15 a liquid inlet port connected to said second
16 aperture through a third fluid channel for receiving
17 said liquid reactant at a flow rate and a pressure
18 above said given pressure,

19 a diaphragm disposed adjacent to said second
20 aperture for forming a vaporization region having a
21 pressure gradient, said vaporization region
22 circumscribing said liquid inlet port and having a
23 substantially larger width than said inlet port, and

24 wherein liquid reactant supplied through said
25 liquid inlet port vaporizes in said valve cavity to
26 form a vaporized reactant, mixes with said carrier
27 gas, and is carried out of said vaporizer through said
28 outlet port.

